

Thurston County Mineral Lands Project Stakeholder Group Meeting April 19, 2017

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3 Square Blocks



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Engineering and Mining Geology

Weinman Consulting, LLC

Agenda

- Coffee, Cookies and Mingling
- Welcome and Introductions
- Presentation and Q&A
 - Project Overview
 - Thurston County Geology
 - Classification Table and Inventory Map
 - Q&A
- Break Out and Review Materials



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Project Overview



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Background

- Most counties in WA designate mineral lands based on approved mining projects
- Growth Management Act (GMA) statutes and rules indicate all mineral lands of long-term commercial significance should be identified, classified, designated and conserved comprehensively in advance, not site-by-site
 - Snohomish County currently does this
 - With this project, Thurston County is also leading the way
- Thurston County mineral lands designations have been previously appealed and revised to comply with Growth Management Hearings Board (GMHB) decisions. This project builds on that foundation.



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Project Purpose

- Identify, classify and designate mineral resource lands of long-term commercial significance in Thurston County
- Ensure the County's policies and regulations are effective and consistent with the GMA
- Inform the 2018 Comprehensive Plan update



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Phases of Work

- Inventory and Classification (Dec 2016 – May 2017)
 - Identify, classify and map all lands in Thurston County containing mineral resources such as sand and gravel and bedrock deposits, based on available geotechnical information
- Designation (April 2017 – June 2017)
 - Review Comprehensive Plan policies on designation process and criteria and recommend updates
 - Screen the inventory against designation criteria that take into account land use and environmental considerations
- Regulations (June 2017)
 - Recommend regulatory updates for consistency with Comprehensive Plan policies



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Community Engagement

- April - June 2017
 - Stakeholder group meeting(s)
 - Property owner comment period May 1-24
 - Open house May 17
 - Informational briefings at meetings of Planning Commission and Board of County Commissioners
- July 2017 – Spring/Summer 2018
 - Public engagement for Comprehensive Plan Update
 - Final decisions made when Update is completed



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Thurston County Geology



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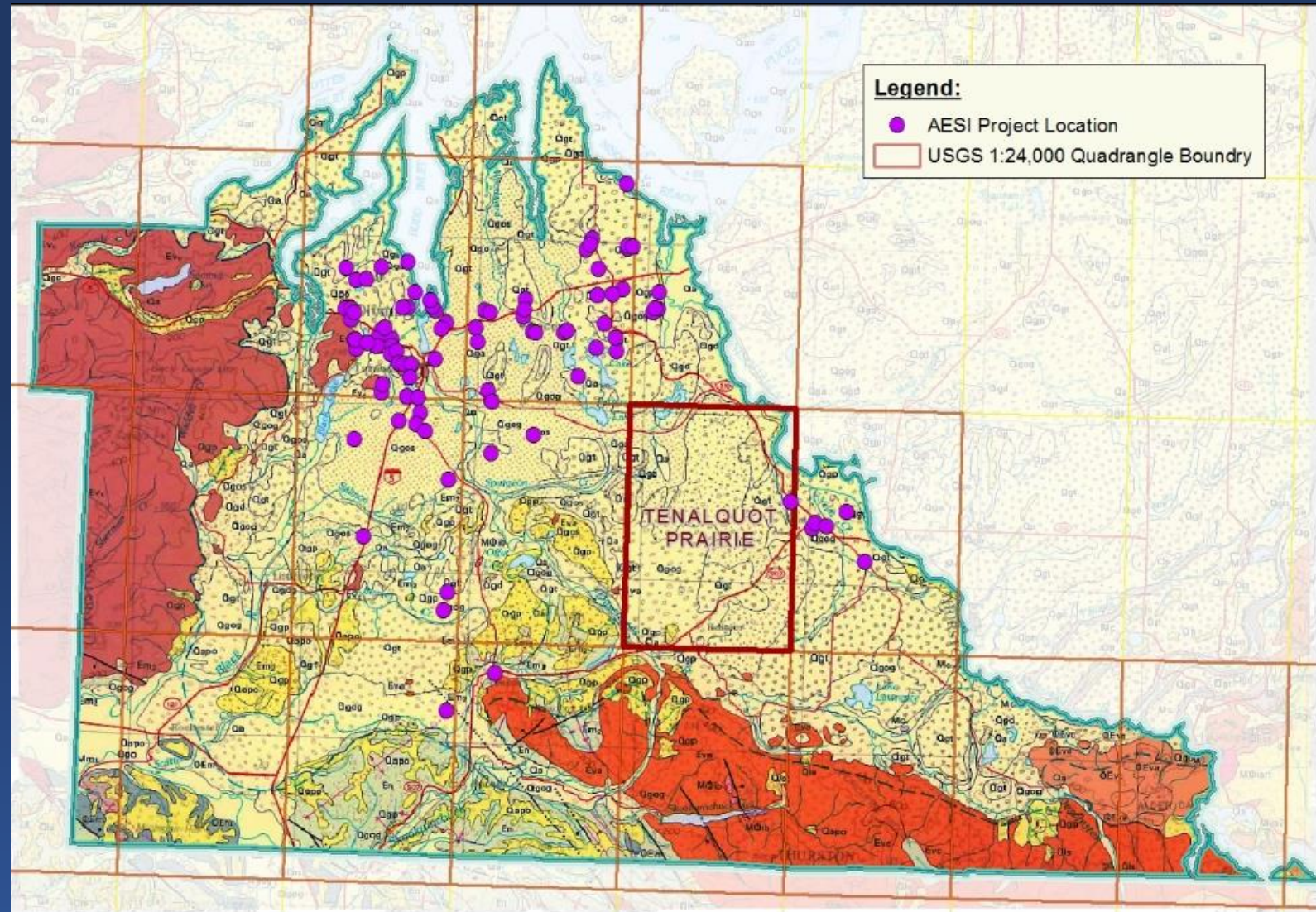
Geologic Setting of Resources

- Three resource geo-settings:
 - (1) Glacial Outwash—Vashon Recession
 - (2) Glacial outwash Vashon Advance
 - (3) Volcanic Bedrock
- Example (right) braided river deposits



Geologic Mapping of Thurston County

- Brief Geology Overview—Aggregate and Rock!
- Volcanic bedrock formations noted
- VASHON
CONTINENTAL
GLACIATION



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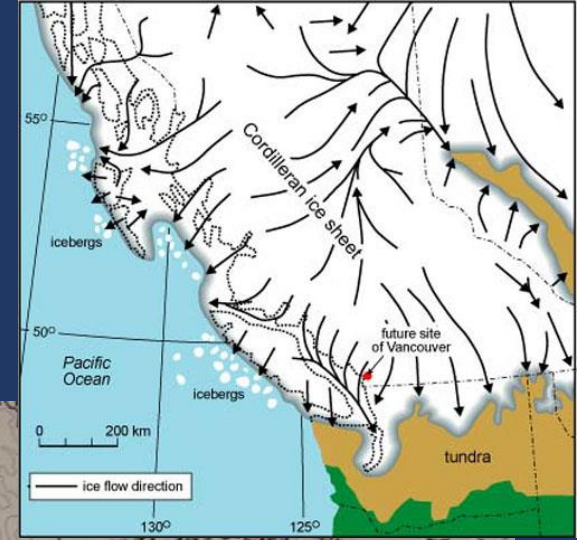
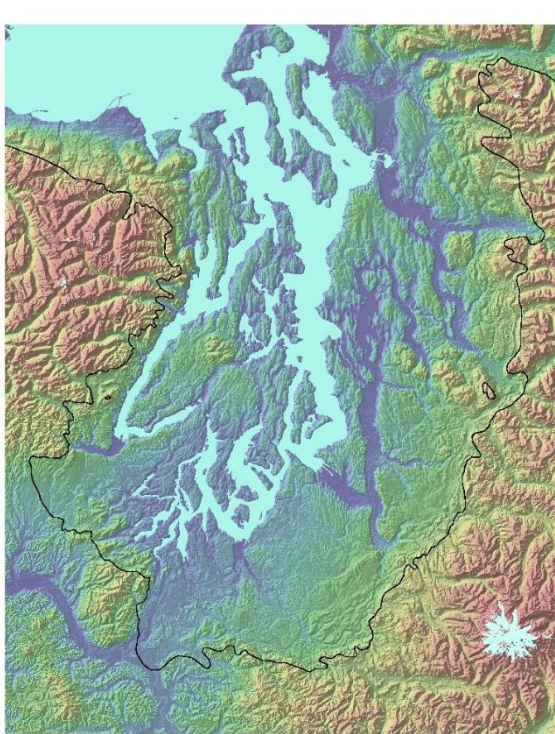
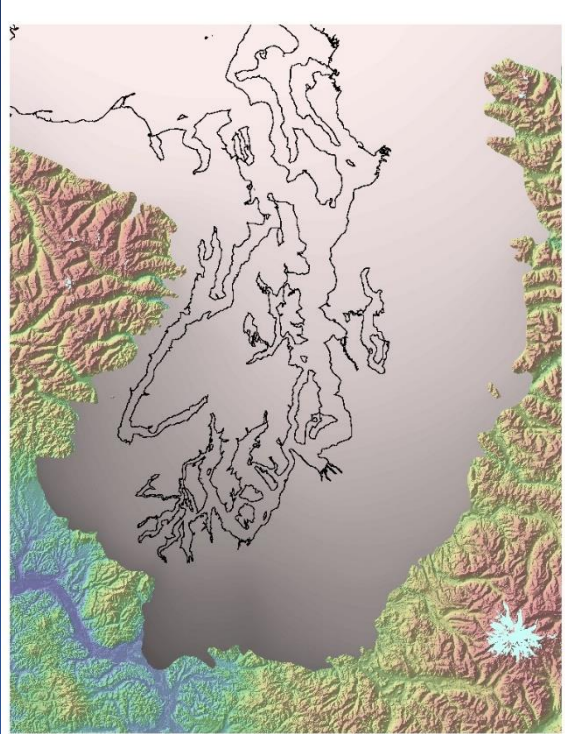


3SQUAREBLOCKS

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Aggregate Resource and Continental Glaciation (18-10ka)



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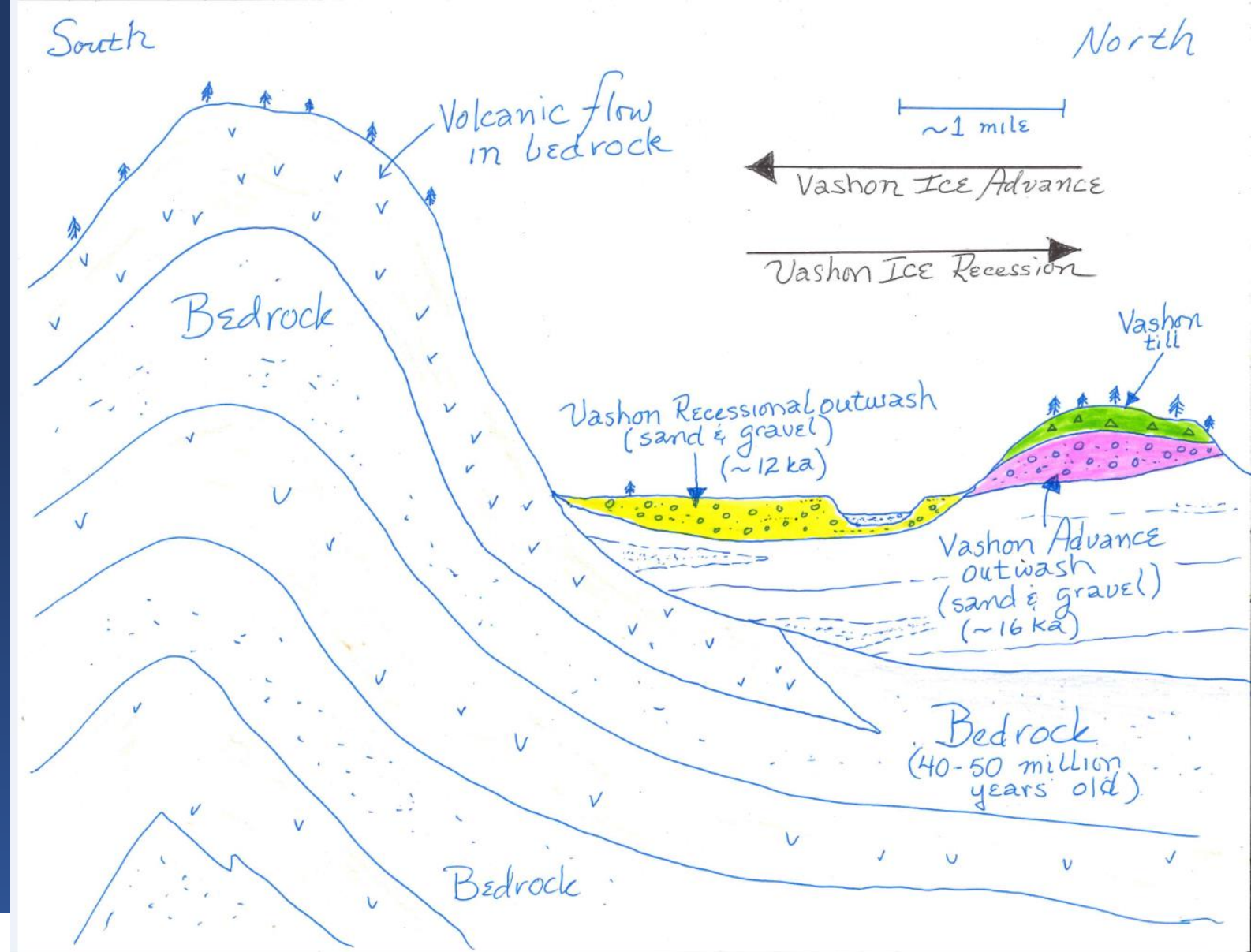


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North-South Cartoon Cross Section

- Bedrock old volcanic uplands. Note the volcanic flow beds and the general scale.
- Vashon Advance outwash deposited during ice advance and under the till.
- Vashon Recessional outwash (our Qgo friend) deposited during ice recession and IS THE MAIN RESOURCE. Qgo is typically thin!



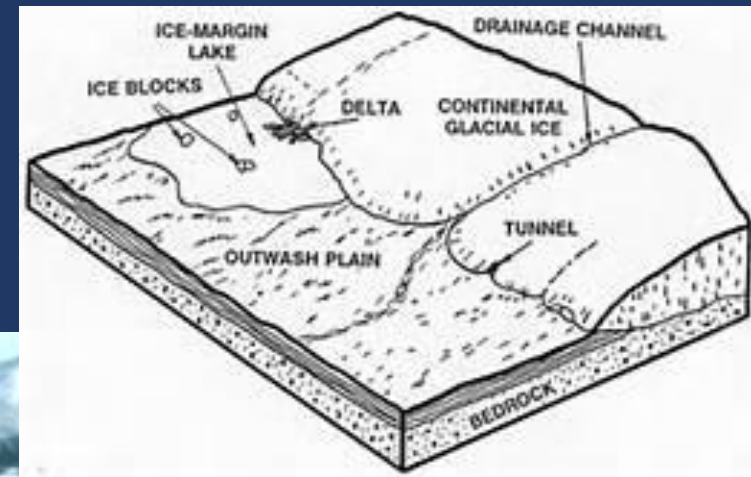
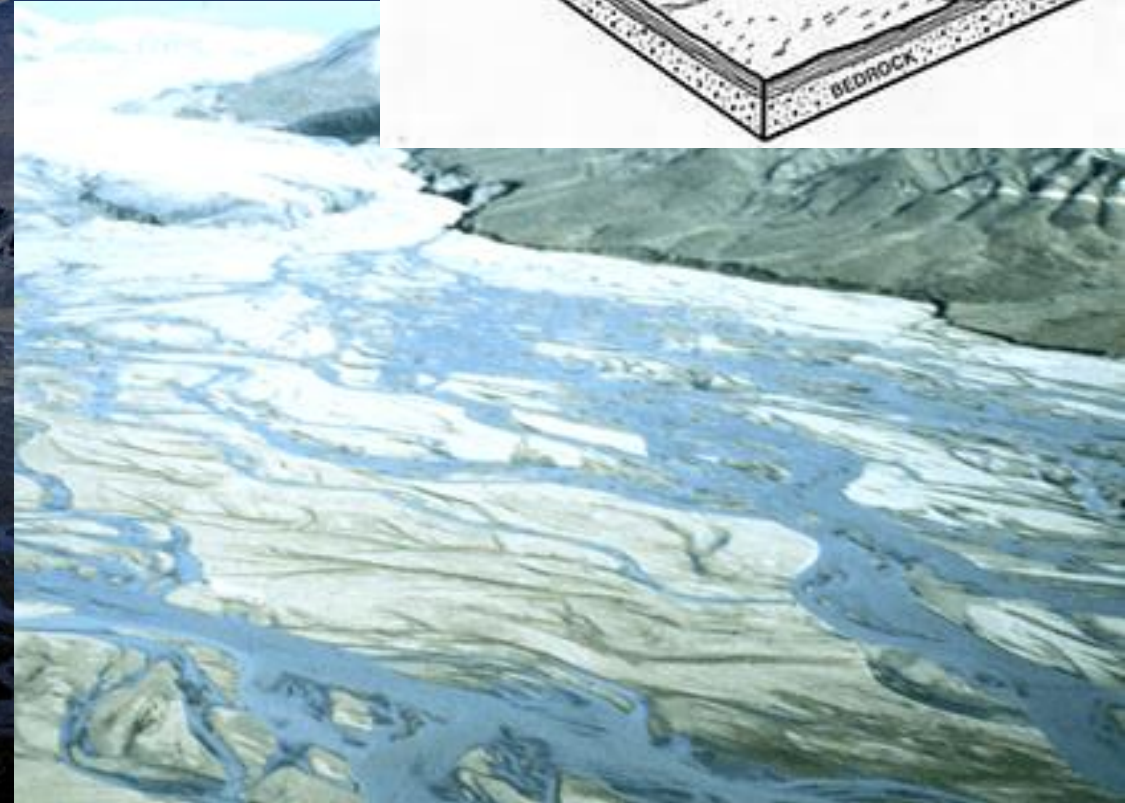
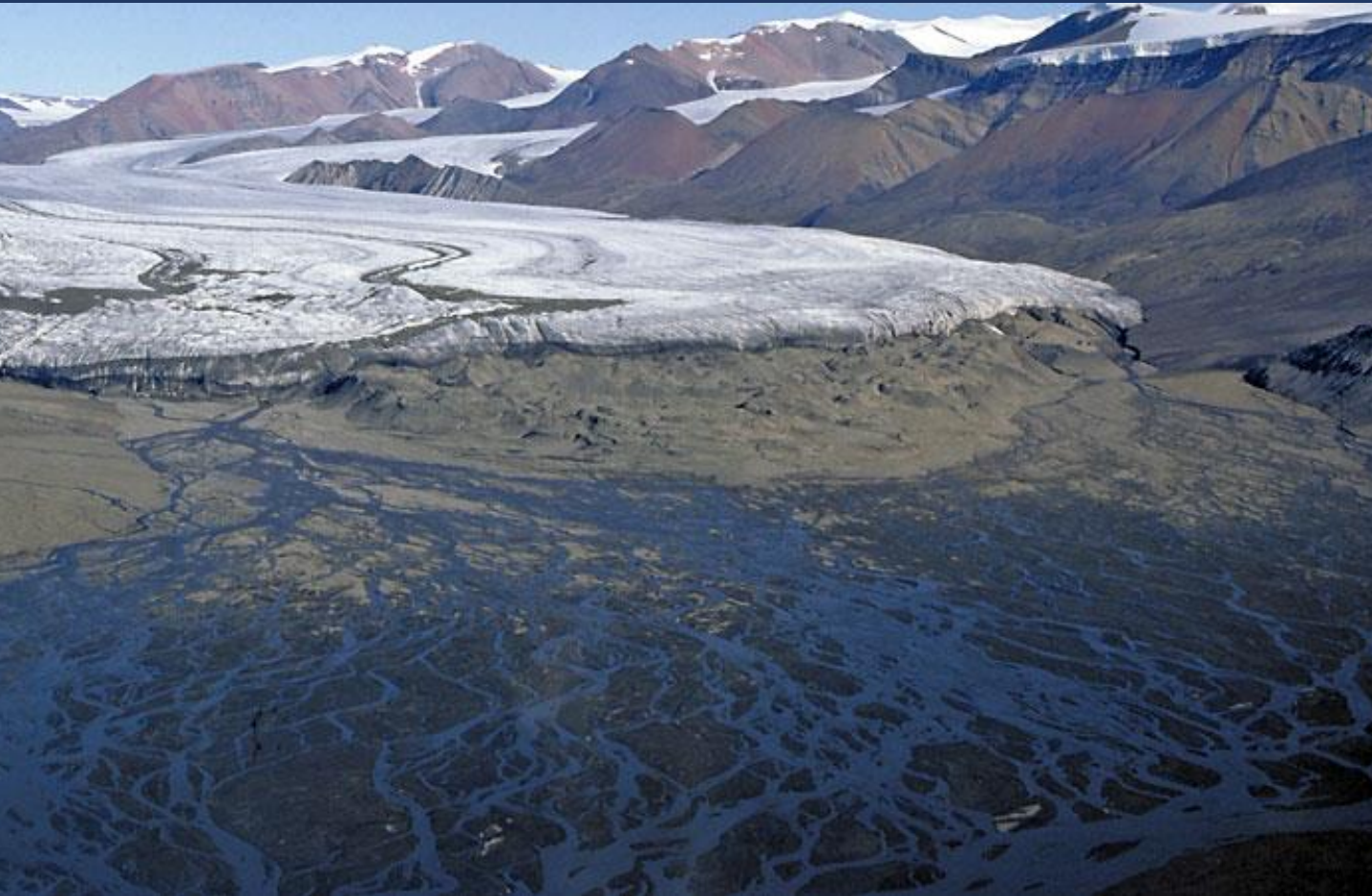
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Braided River Deposits in Outwash Plains



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Classification Table



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Major Sources of Information for the Thurston County Mineral Resource Lands Study

Data Source	Notes
Thurston County (TC) geologic map compilation	TC GIS geologic map compilation and metadata derived from DGER information
TC subsurface data compilation	TC subsurface data (improved from USGS and other datasets)
TC active mine dataset	
LidAR imagery	Used to update geologic mapping of resource areas particularly where only 1:100,00-scale geologic mapping exists. Covers all of TC
Washington State Department of Natural Resource Division of Geology and Earth Resources (DGER) 24k and 100k geologic mapping of TC	24k and 100k geologic mapping covers the TC
DGER subsurface database	Large dataset with wells, borings and geotechnical studies (some with sieve data). Information covers much of TC and includes DOE water well reports, geotechnical reports and other information
DGER mine database	Active and inactive permitted mine database including reclamation plans
DGER Shelton quadrangle resource study	Covers the northwest corner of TC
DGER Pierce and Lewis County Resource studies	Adjacent resource studies consulted
Washington State Department of Transportation (DOT) active and inactive mine database	DOT mine information including reclamation plans, cross sections, drilling logs,
DOT subsurface database	Database of borings along major highways
DOT aggregate and rock quality database	Aggregate and bedrock quality data (sieve, LA abrasion tests, etc...)
United State Geologic Survey (USGS) topographic maps	7.5-minute topographic maps of the TC with mine with pit, mine and quarry location information
USGS geohydrology study of Thurston County of Droost and others (1998, 1999)	Variety of surface and subsurface information including subsurface data, cross sections, etc.... covers most of the county
USGS geohydrology geology and geohydrology study of Thurston County of Walters and Kimmel (1966)	Variety of surface and subsurface information including subsurface data, cross sections, etc.... covers most of the county
Associated Earth Science Inc. (AESI) project information	Provides additional surface and subsurface site specific information including resource quality and quantity information at various site across the county including sediment sieve analysis at several sites
Miscellaneous Geologic Publications	Examples include Lea (1984) and Globerman (1981) TC thesis studies



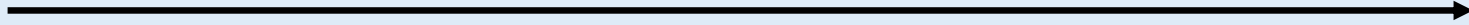


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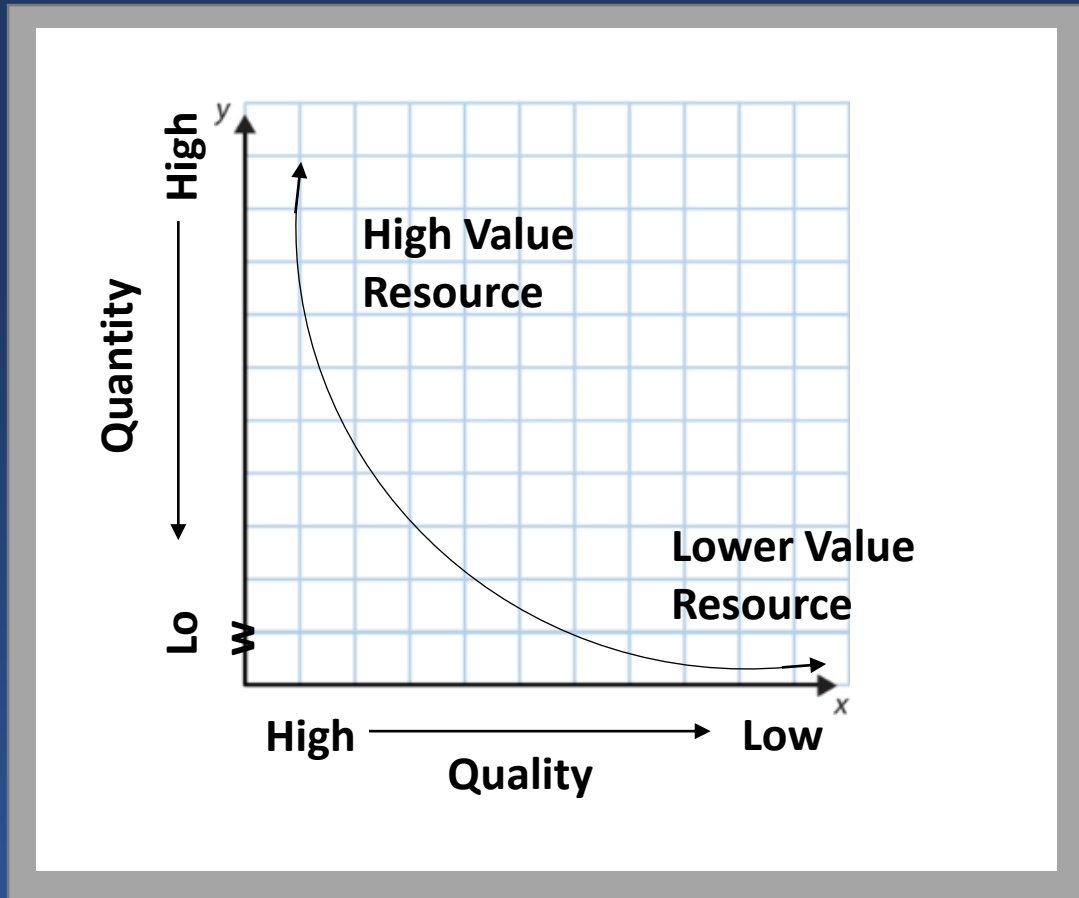
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Table 1. Thurston County Mineral Resource Lands Aggregate Quarry Rock Classification System

Sand and Gravel (Aggregate)		Resource Strata decreasing resource quality 			Non-Resource
		Quality Type A ¹	Quality Type B ²	Quality Type C ³	Quality Type D ⁴
Decreasing resource thickness and volume 	Quantity Type 1	<ul style="list-style-type: none"> • <5 percent fines⁵ • 70:30 to 30:70 sand and gravel ratio • >25 years' life expectancy • Minimum 240,000 yd³/acre • >100 feet thick • Minimum overburden 	<ul style="list-style-type: none"> • Up to 15 percent fines⁵ • 70:30 to 30:70 sand and gravel ratio • >25 years' life expectancy • Minimum 240,000 yd³/acre • >100 feet thick • Minimum overburden 	<ul style="list-style-type: none"> • Up to 25percent fines⁵ • 70:30 to 30:70 sand and gravel ratio • >25 years' life expectancy • Minimum 240,000 yd³/acre • >100 feet thick • Minimum overburden 	<ul style="list-style-type: none"> • Generally unsuitable for extraction • >25 percent fines⁵, may have high organic content • Out of 70:30 to 30:70 sand and gravel range • No life expectancy • <15,000 yd³/acre • Limited depth
	Quantity Type 2	<ul style="list-style-type: none"> • <5 percent fines • 70:30 to 30:70 sand and gravel ratio • 10 to 25 years' life expectancy • Average 80,000 to 240,000 yd³/acre • 50 to 100 feet thick • Overburden <15 feet thick 	<ul style="list-style-type: none"> • Up to 15 percent fines • 70:30 to 30:70 sand and gravel ratio • 10 to 25 years' life expectancy • Average 80,000 to 240,000 yd³/acre • 50 to 100 feet thick • Overburden <15 feet thick 	<ul style="list-style-type: none"> • Up to 25 percent fines • 70:30 to 30:70 sand and gravel ratio • 10 to 25 years' life expectancy • Average 80,000 to 240,000 yd³/acre • 50 to 100 feet thick • Overburden <15 feet thick 	
	Quantity Type 3	<ul style="list-style-type: none"> • <5 percent fines • 70:30 to 30:70 sand and gravel ratio • Life expectancy variable, generally <10 years • Average 15,000 to 80,000 yd³/acre • Thickness varies, typically <50 feet 	<ul style="list-style-type: none"> • Up to 15 percent fines • 70:30 to 30:70 sand and gravel ratio • Life expectancy variable, generally <10 years • Average 15,000 to 80,000 yd³/acre • Thickness varies, typically <50 feet 	<ul style="list-style-type: none"> • Up to 25 percent fines • 70:30 to 30:70 sand and gravel ratio • Life expectancy variable, generally <10 years • Average 15,000 to 80,000 yd³/acre • Thickness varies, typically <50 feet 	
Quarry Rock ⁶ (Bedrock)		Quality Type A	Quality Type B ¹³	Quality Type C ⁷	Quality Type D ⁸
Decreasing interbedded resource strata 	Type 1 ¹⁰	<ul style="list-style-type: none"> • Formation generally well mapped and (or) high percentage of formation contains resource strata of type A • Meets or exceeds WSDOT specs for all rock products • Minimal amount of fractures⁹ • Minimal percent waste rock • 20 percent or more rockery- size material produced 	<ul style="list-style-type: none"> • Formation mostly divided locally and contains a high percentage of resource strata of type B • Meets WSDOT specs for some rock products • Fractures vary from minor to very prevalent⁹ • Up to 10 percent waste rock • 20 percent or less rockery-size material produced¹⁰ 	<ul style="list-style-type: none"> • Formation mostly divided locally and contains a high percentage of resource strata of type C • Rock will not meet WSDOT specs • Highly fractured⁹ • 10 to 30 percent waste rock • Minimal rockery-size material produced¹⁰ 	<ul style="list-style-type: none"> • Generally unsuitable for extraction⁸ • >30 percent waste rock • Highly to very highly fractured⁹ and (or) weathered and (or) poorly lithified • No rockery-size material produced
	Type 2 ¹¹	None	<ul style="list-style-type: none"> • Formation undivided¹² and >50% of formation contains mostly resource strata of type B as defined for Type 1 bedrock 	<ul style="list-style-type: none"> • Formation undivided¹² and >50% of formation contains mostly resource strata of type C as defined for Type 1 bedrock 	
	Type 3 ¹¹		<ul style="list-style-type: none"> • Formation undivided¹² and <50% formation contains mostly resource strata of type B as defined for Type 1 	<ul style="list-style-type: none"> • Formation undivided¹² and <50% of formation contains mostly resource strata of type C as defined for Type 1 	

Resource Classification System



Inventory Map



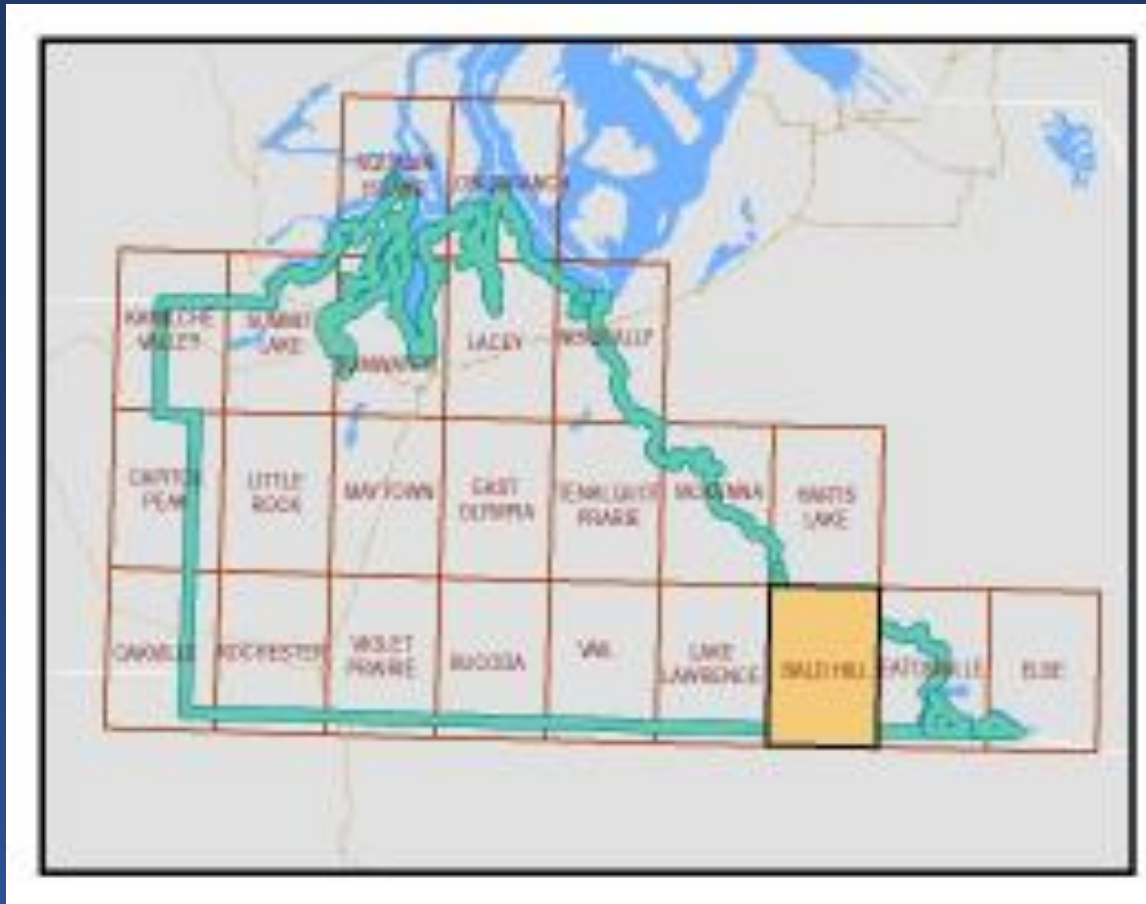
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Quadrangles

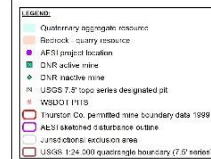
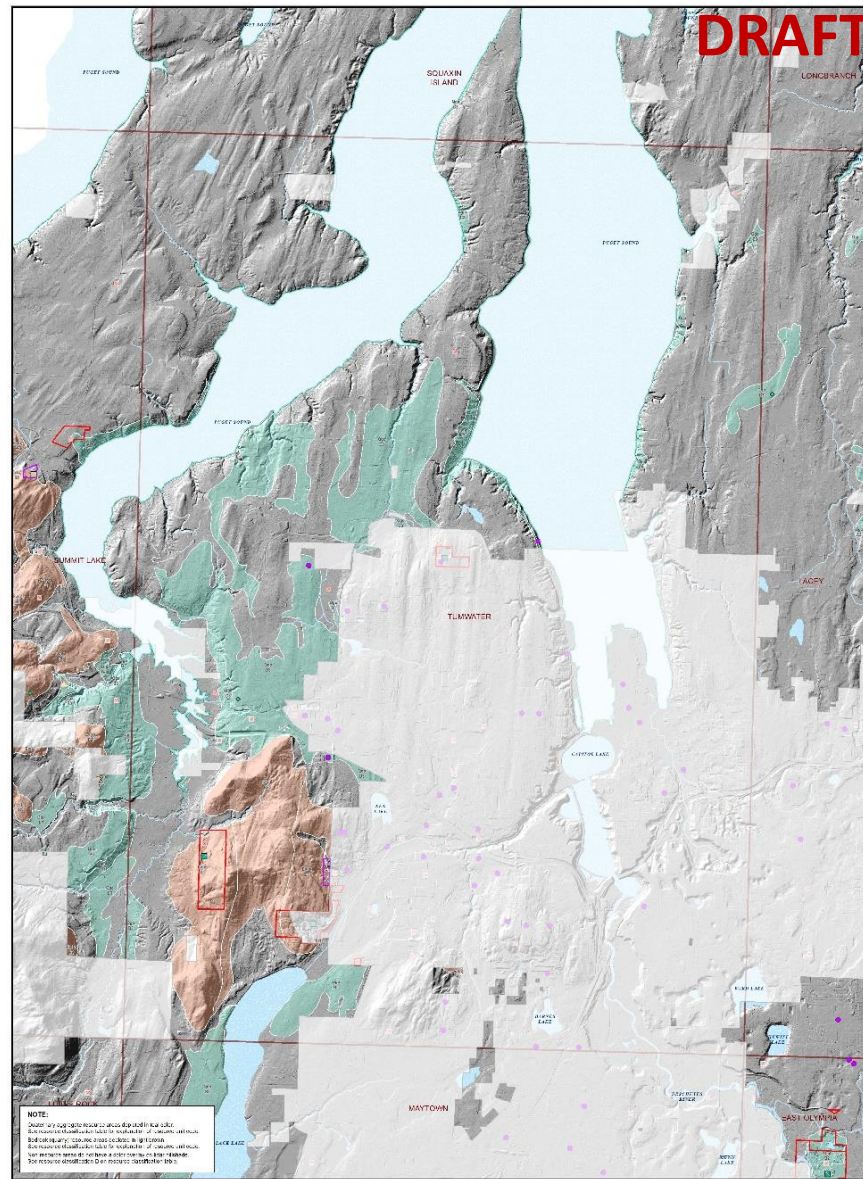


Example Quads

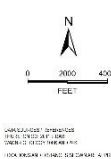
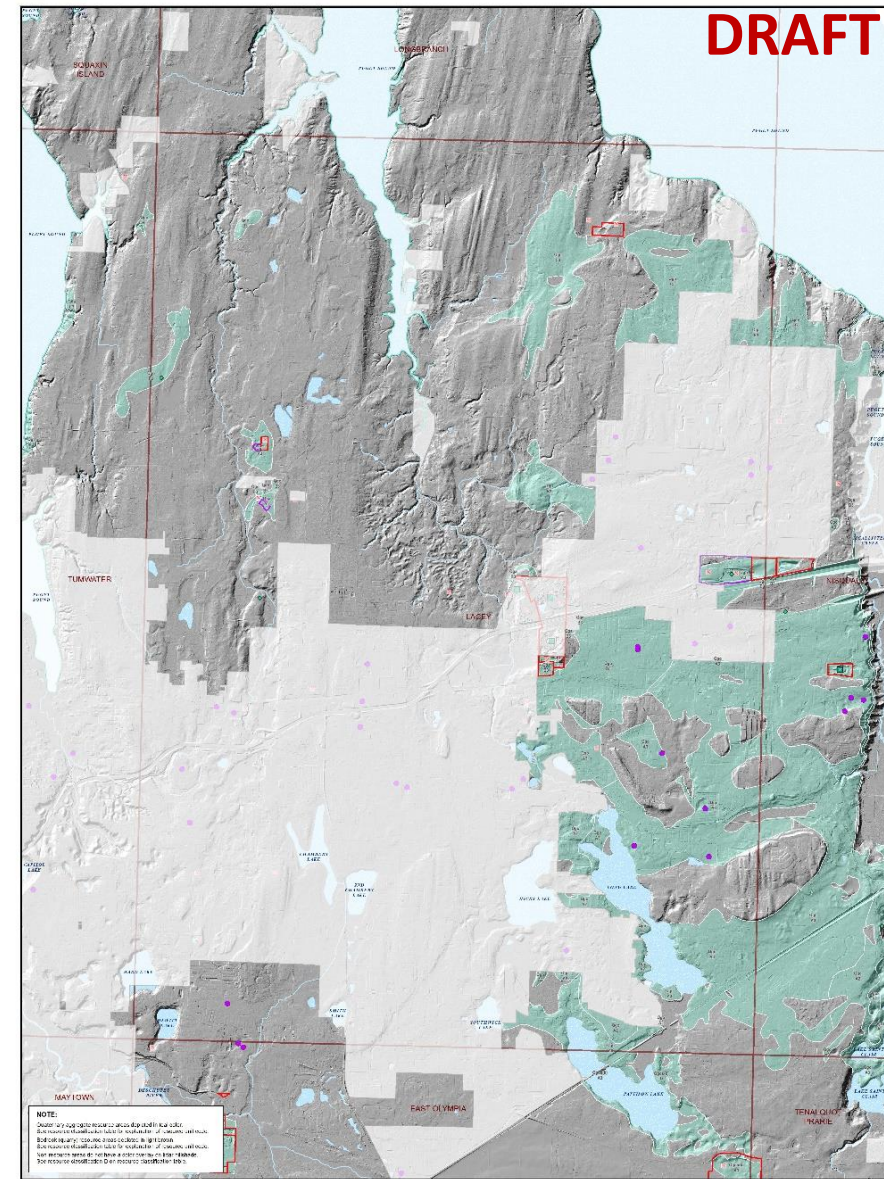
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Legend

- Green = Sand & Gravel
- Brown = Bedrock
- White = Non-County Land
- Grey = Other Land
- Red Outlines = Existing designated mineral lands and mining activities



Mineral Resource Inventory
TUMWATER
Thurston County, WA



Mineral Resource Inventory
LACEY
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